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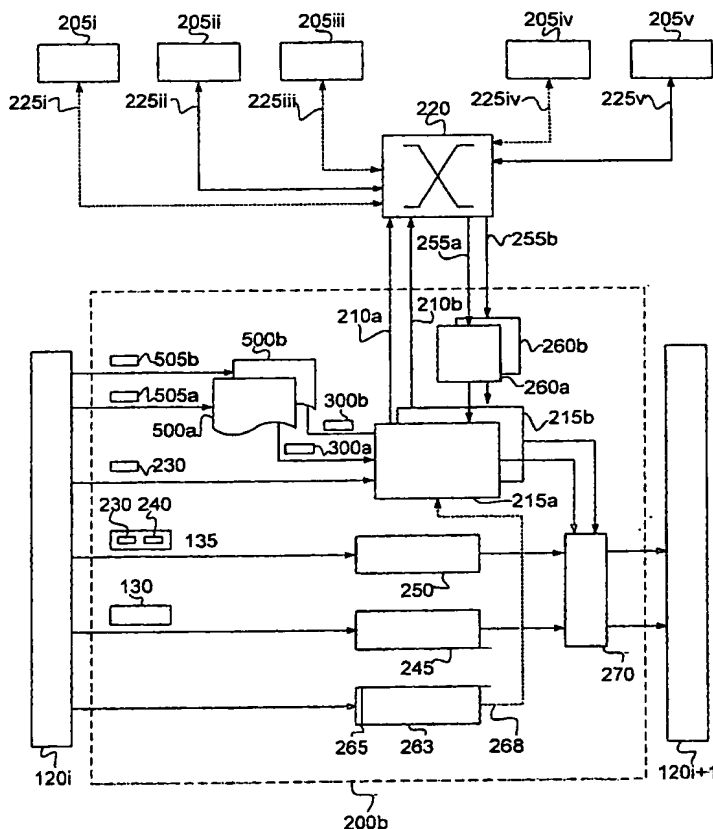
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(54) Title: METHOD AND APPARATUS FOR PIPELINED PROCESSING OF DATA PACKETS



(57) Abstract: The present invention relates to a method and apparatus for pipelined processing of data packets. A pipeline in a processor comprises an access point providing simultaneous access to one or more devices, said devices mainly for data processing operations not provided by the pipeline. The access point comprises at least one FIFO store for storing data entering the access point, a response FIFO store for storing responses received from the device(s), and a synchronisation mechanism adapted to synchronise the fetching of the first entry in the FIFO store(s) and the first entry in the response FIFO store. The synchronisation mechanism could advantageously be a fixed time delay mechanism. When the fixed time initiated by the fixed time delay mechanism has elapsed, the first response in the response FIFO store is merged into the data stored in the first entry in the FIFO store(s) for storing data entering the access point.



Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,  
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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**Published:**

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/01197

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 9/38, G06F 15/76, G06F 12/00  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F, H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO 02096043 A1 (XELERATED NETWORKS AB), 28 November 2002 (28.11.02), claims 1-23, abstract	1-24
	--	
A	WO 0161469 A2 (KONINKLIJKE PHILIPS ELECTRONICS N.V.), 23 August 2001 (23.08.01), page 2, line 31 - page 3, line 27; page 4, line 7 - page 8, line 31, claims 1-16, abstract	1-24
	--	
A	US 6418497 B1 (GUTHRIE, G.L. ET AL), 9 July 2002 (09.07.02), whole document	1-24
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002083298 A1 (COOK, P.W. ET AL), 27 June 2002 (27.06.02), whole document --	1,19
A	US 6389479 B1 (BOUCHER, L.B. ET AL), 14 May 2002 (14.05.02), claims 1-27 --	1,19
A	US 6049816 A (KIM, B.-K. ET AL), 11 April 2000 (11.04.00), whole document --	1,19
A	EP 1158726 A2 (ALCATEL INTERNETWORKING (PE), INC), 28 November 2001 (28.11.01), claims 1-26, abstract -- -----	1,19

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

26/07/03

International application No.  
PCT/SE 03/01197

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	02096043	A1	28/11/02	SE	0101133 D	00/00/00
WO	0161469	A2	23/08/01	EP	1208424 A	29/05/02
US	6418497	B1	09/07/02	NONE		
US	2002083298	A1	27/06/02	NONE		
US	6389479	B1	14/05/02	AU	1533399 A	21/03/00
				CA	2341211 A	09/03/00
				EP	1116118 A	18/07/01
				JP	2002524005 T	30/07/02
				US	6427171 B	30/07/02
				US	6591302 B	08/07/03
				US	2001047433 A	29/11/01
				US	2002091844 A	11/07/02
				US	2002147839 A	10/10/02
				WO	0013091 A	09/03/00
				US	6226680 B	01/05/01
				US	6247060 B	12/06/01
				US	6334153 B	25/12/01
				US	6393487 B	21/05/02
				US	6427173 B	30/07/02
				US	2001021949 A	13/09/01
				US	2001023460 A	20/09/01
				US	2001027496 A	04/10/01
				US	2001036196 A	01/11/01
				US	2001037397 A	01/11/01
				US	2001037406 A	01/11/01
				US	2002087732 A	04/07/02
				US	2002095519 A	18/07/02
				US	2002161919 A	31/10/02
				US	6434620 B	13/08/02
US	6049816	A	11/04/00	KR	237642 B	15/01/00

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

26/07/03

International application No.  
PCT/SE 03/01197

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
EP	1158726	A2	28/11/01	AU 4620501 A	29/11/01
				AU 4620801 A	29/11/01
				CN 1359213 A	17/07/02
				CN 1359217 A	17/07/02
				EP 1158724 A	28/11/01
				EP 1158725 A	28/11/01
				EP 1158727 A	28/11/01
				EP 1158728 A	28/11/01
				EP 1158729 A	28/11/01
				EP 1158730 A	28/11/01
				JP 2002044150 A	08/02/02
				JP 2002051080 A	15/02/02
				JP 2002051081 A	15/02/02
				JP 2002064528 A	28/02/02
				JP 2002064563 A	28/02/02
				JP 2002077269 A	15/03/02
				US 2001037396 A	01/11/01
				US 2001046229 A	29/11/01
				US 2001048661 A	06/12/01
				US 2001053150 A	20/12/01
				US 2002016856 A	07/02/02
				US 2002085560 A	04/07/02
				US 2002089929 A	11/07/02

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